

# ***Iteration #2 Results***

***Adult Fallback Modeling***

***Anadromous Fish Sub Group***

SRT Meeting – March 14, 2013  
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## Outline

- Metrics/evaluation criteria
- Overview of the model and methods
- Modeling results
- Summary

## Background

- Fallback occurs when migrating adult fish ascend a fishway at a dam and then pass back to the tailrace through some passage route
- Fallback can result in direct mortality or injury
- Also may increase travel time to spawning grounds and decrease energy reserves

# Metrics/Evaluation Criteria

- Used published relationships for adult fallback as a function of flow to predict fallback for Treaty discharge scenarios for adult Chinook salmon
- Metrics evaluated:
  - Average percentage fallback across dams
  - Probability of falling back at least once
- Applies to the four dams on the Lower Columbia River for Sp/Su Chinook salmon only

## Modeling Methods

- Boggs et al. (2005) radio-tagged 7,568 Sp/Su Chinook salmon from 1996-2003 at Bonneville Dam
- They regressed % fallback at on mean April-July flow at the four Lower Columbia River dams
- Keefer et al. (2005) reported escapement estimates for these radio-tagged fish by those that fell back and those that did not
- We extracted regression parameters and escapement estimates from these reports to use in predictive models

## Modeling Methods

- Approach for generating fallback predictions
  - Calculate seasonal average flow (April-July) from HYDSIM output at each dam for each water year in each scenario
  - Apply regression model parameters to get predicted fallback
  - Calculate average fallback across dams and chance of falling back at least once
- Calculate predicted escapement loss due to fallback by multiplying proportion falling back at least once by expected loss (7.45%, based on Keefer et al. 2005)

## Results

# Columbia River Treaty 2014/2024 Review

## Modeling Results

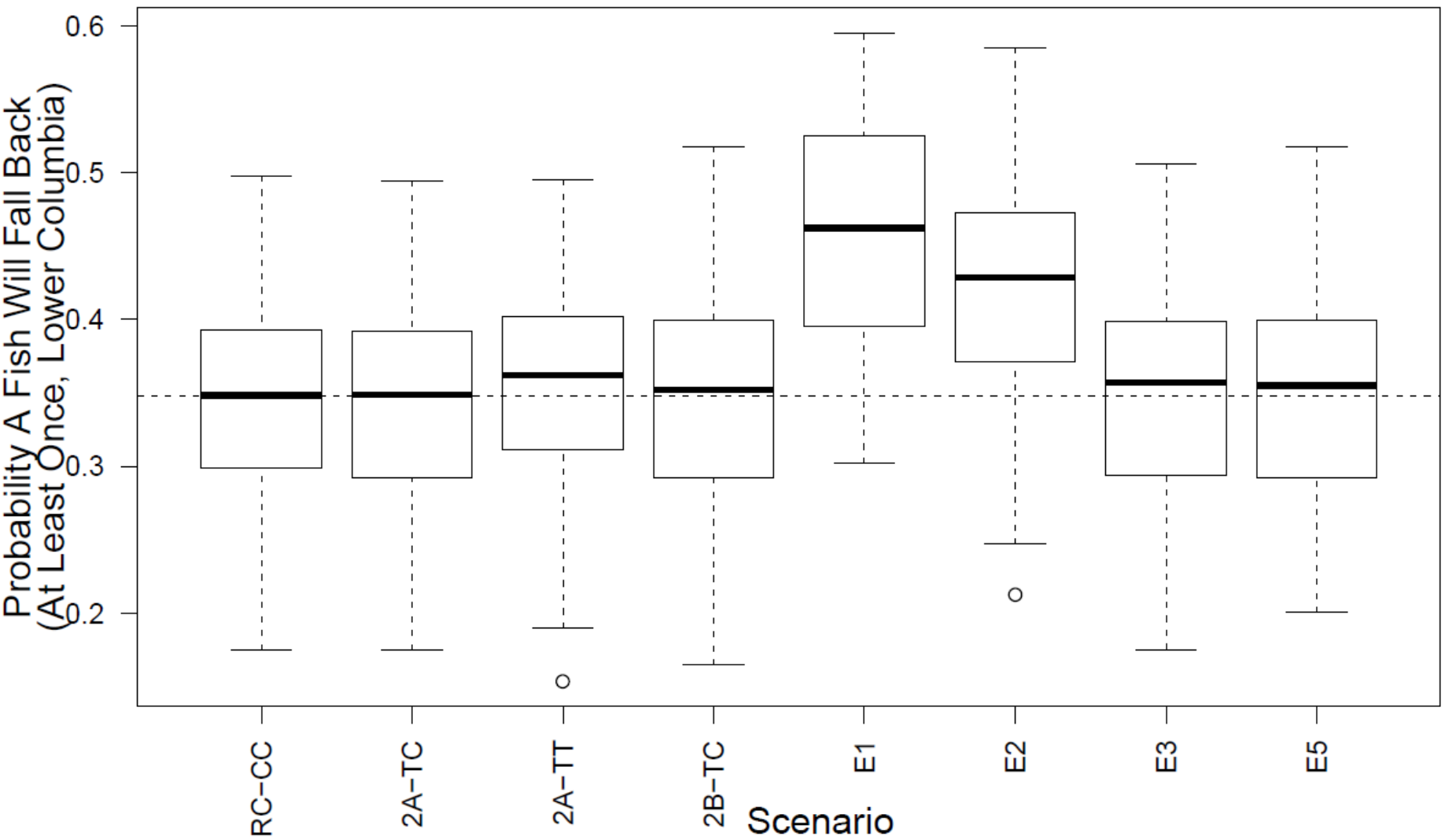
Alternative	Mean Fallback (%)	% Chance 1 or More Fallbacks	Escapement Loss (%)
RC-CC	9.9	33.9	2.53
2A-TC	9.9	34.0	2.54
2A-TT	10.3	35.0	2.61
2B-TC	10.1	34.4	2.56

Alternative	Mean Fallback (%)	% Chance 1 or More Fallbacks	Escapement Loss (%)
RC-CC	9.9	33.9	2.53
E1	14.0	45.1	3.36
E2	12.7	41.7	3.10
E3	10.1	34.6	2.58
E5	10.2	34.7	2.59



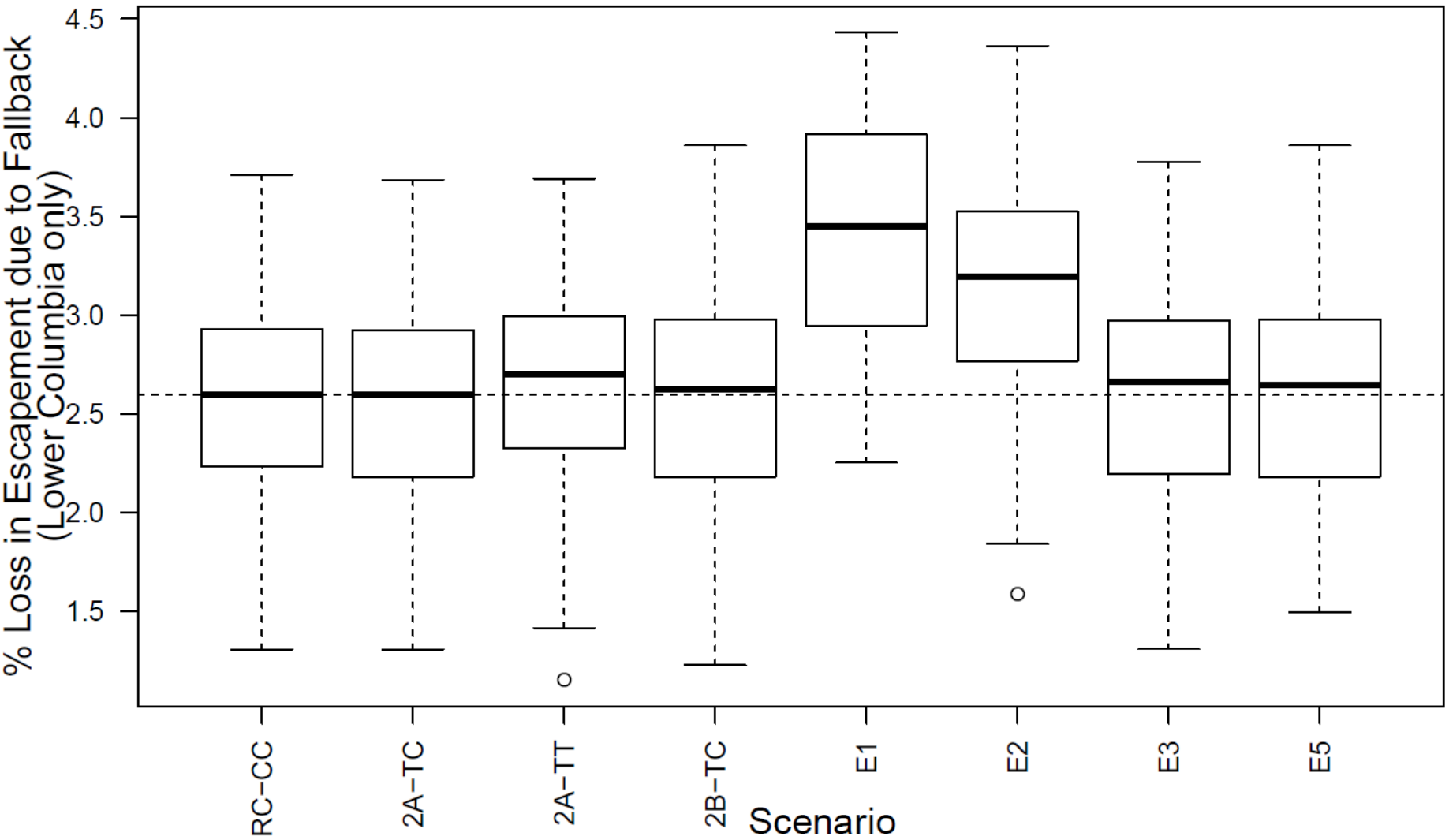
## Boxplots of Yearly Overall Fallback Chance

SP/SU Chinook Salmon

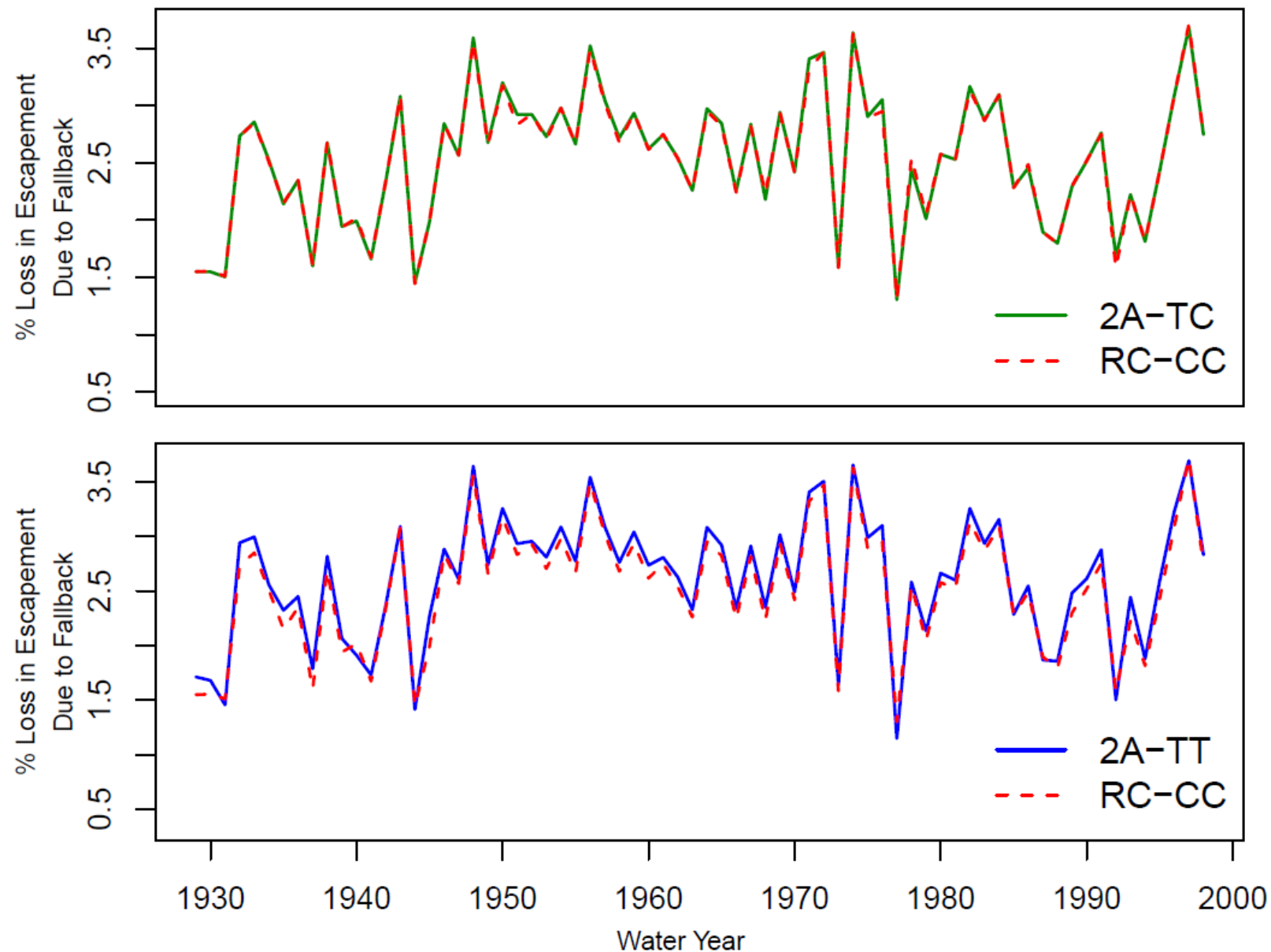


## Boxplots of Yearly Loss in Escapement

SP/SU Chinook Salmon

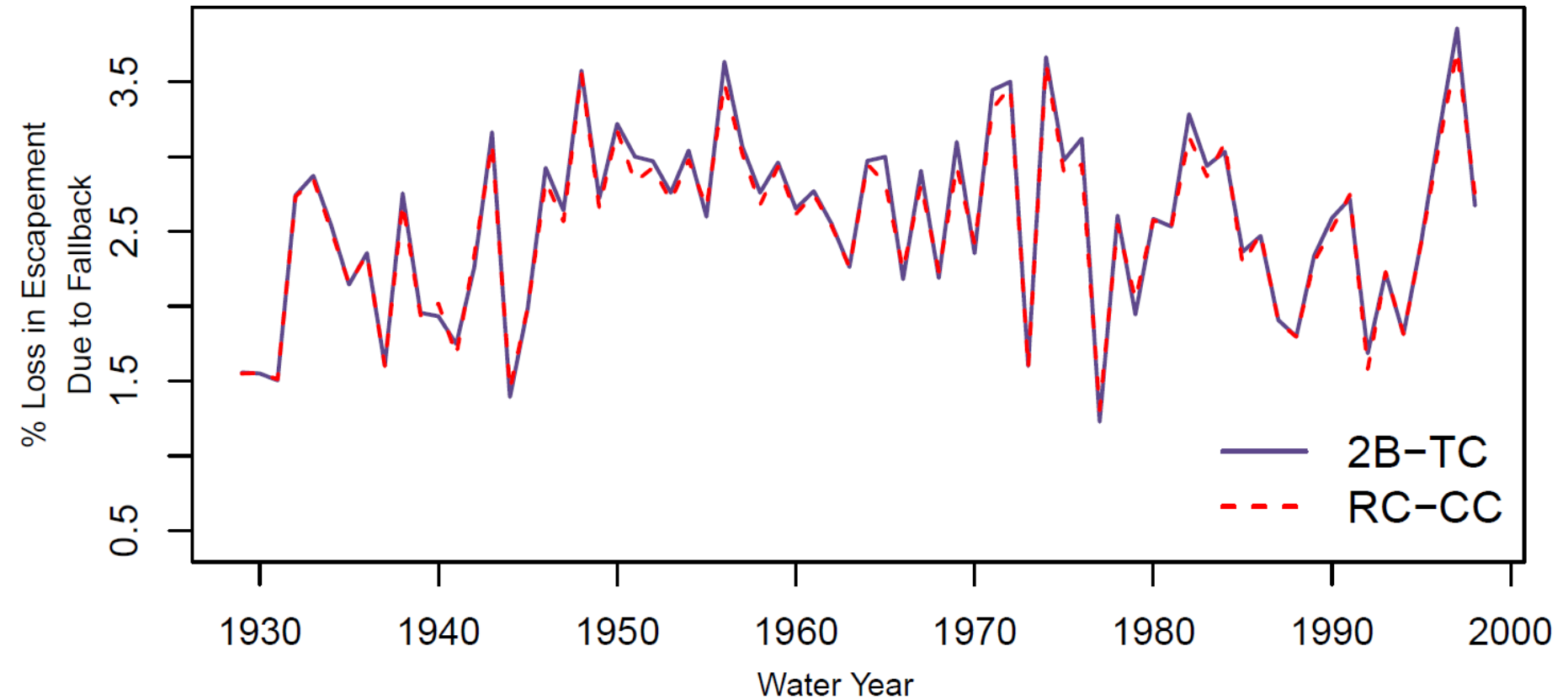


## Columbia River SP/SU Chinook Fallback; Scenarios 2A-TC & 2A-TT

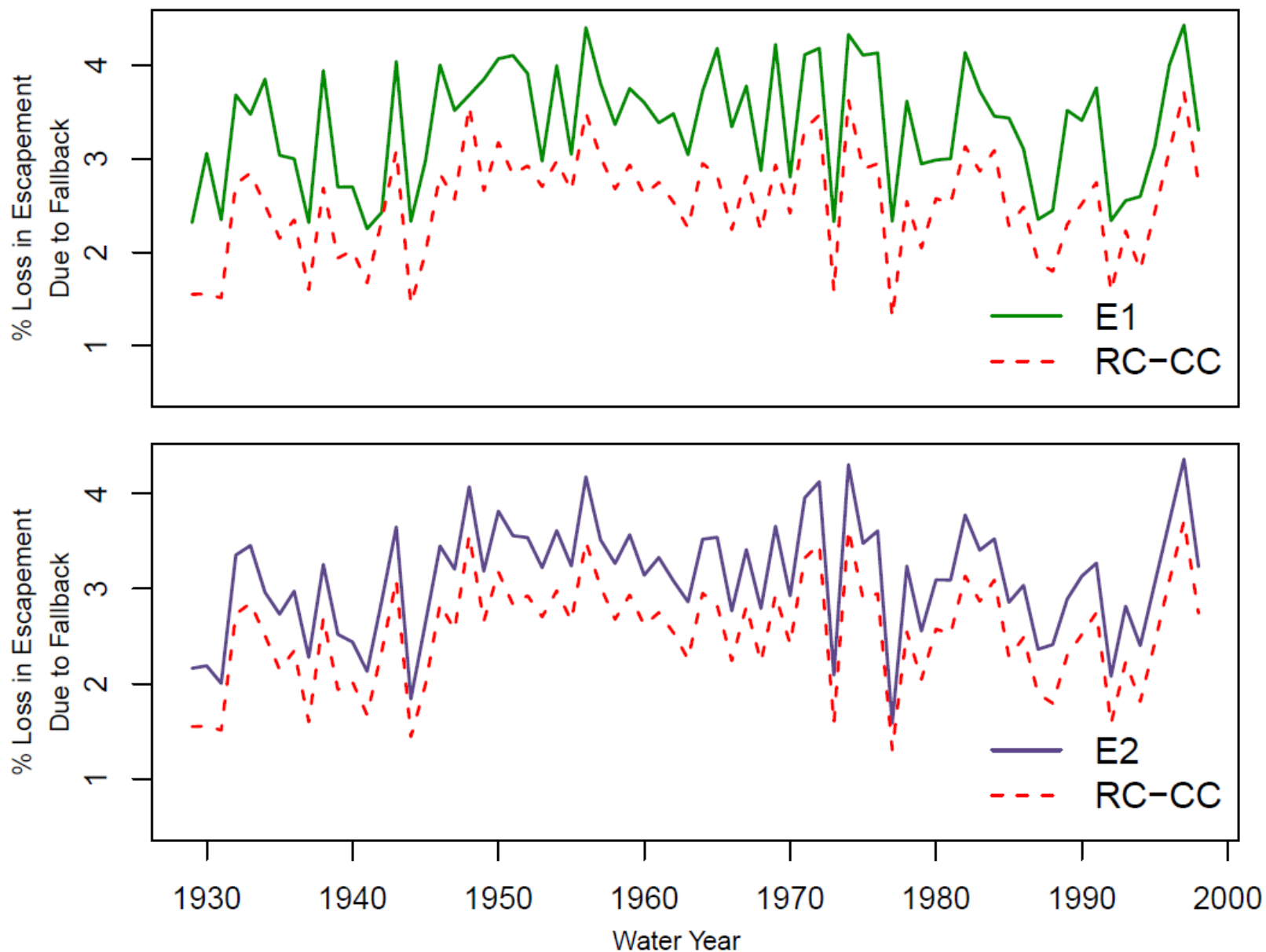


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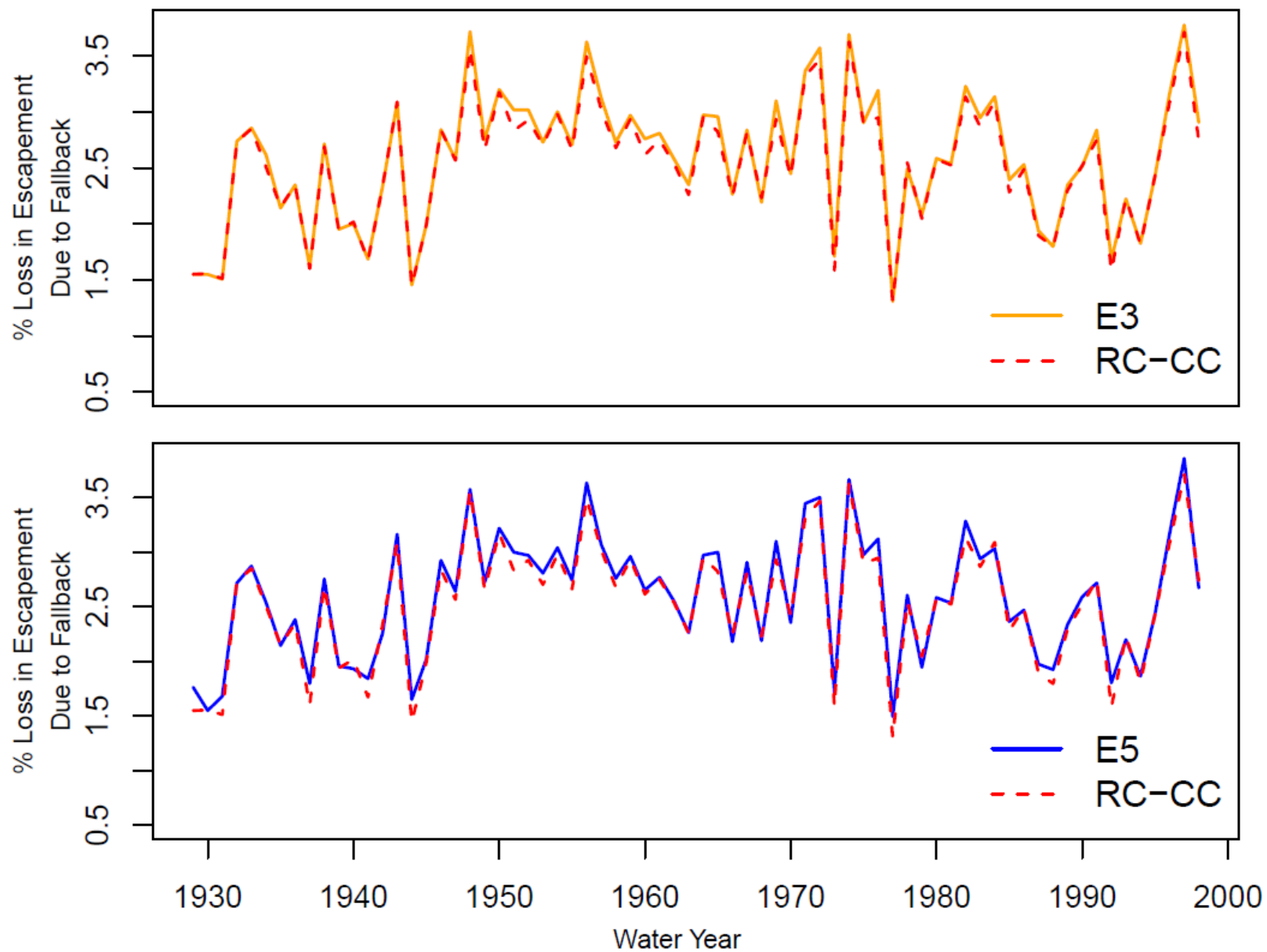
## Columbia River SP/SU Chinook Fallback; Scenarios 2B-TC



## Columbia River SP/SU Chinook Fallback; Scenarios E1 & E2



## Columbia River SP/SU Chinook Fallback; Scenarios E3 & E5



## Summary

- Main results summary
  - Fallback for 2A and 2B scenarios very close to RC
  - E1 and E2 showed increased chance of fallback in every year
  - E3 and E5 showed small increases in fallback in dry years
  - Patterns in predicted loss of escapement follow those for fallback

## Summary

- Important considerations
  - Models for spring Chinook salmon only in Lower Columbia
  - Models only address effects of flow on fallback
  - Models based on seasonal average flow and do not account for dynamics at a finer time scale
  - Provides estimates of reduction in escapement but not direct effects on survival and reproduction
  - Uncertainty in predictions not included



## References

- Boggs, C. T., M. L. Keefer, C. A. Peery, L. C. Stuehrenberg, and B. J. Burke. 2005. Fallback, reascension and adjusted fishway escapement estimates for adult Chinook salmon and steelhead at Columbia and Snake River Dams, 1996-2003. Idaho Cooperative Fish and Wildlife Research Unit Technical Report 2005-6.
- Keefer, M. L., C. A. Peery, W. R. Daigle, M. A. Jepson, S. R. Lee, C. T. Boggs, K. R. Tolotti, and B. J. Burke. 2005. Escapement, harvest, and unknown loss of radio-tagged adult salmonids in the Columbia River – Snake River hydrosystem.
- Boggs, C. T., M. L. Keefer, C. A. Peery, T. C., Bjornn, and L. C. Stuehrenberg. 2004. Fallback, reascension, and adjusted fishway escapement estimates for adult Chinook salmon and steelhead at Columbia and Snake River Dams. Transactions of the American Fisheries Society 133:932-949.